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EXAMINER	
WILSON, SCOTT R	

ART UNIT	PAPER NUMBER
2826	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/564,404	LEE, SUK-HUN	
	Examiner	Art Unit	
	Scott R. Wilson	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *34-36 and 38* is/are allowed.

6)☒ Claim(s) *1-5,7,9-13,17,19,21-24,26,27,31 and 37* is/are rejected.

7)☒ Claim(s) *6,8,14-16,18,20,25,28-30,32 and 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/13/06,2/1/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim language "a buffer layer formed down the n-type nitride" and "a substrate formed down the buffer layer" are non-standard English. The examiner believes that the word "below" is contextually appropriate, and claim 3 will be taken for the rest of this action to have "below" substituted for "down". Appropriate correction is required.

Claim 17 recites the limitation "$In_xGa_{1-x}N/In_yGa_{1-y}N$ layers of the second electrode contact layer" in lines 1 and 2 of the claim. There is insufficient antecedent basis for this limitation in the claim. The context of the claim suggests that it should depend from claim 16. For the remainder of this action, claim 17 will be taken to depend from claim 16. Appropriate correction is required.

Claim 21 recites the limitation " the In-containing super lattice structure layer formed of $In_xGa_{1-x}N/In_yGa_{1-y}N$ " in lines 2 and 3 of the claim. There is insufficient antecedent basis for this limitation in the claim. The context of the claim suggests that it should depend from claim 16. For the remainder of this action, claim 21 will be taken to depend from claim 16. In addition, "at least one" appears to be incorrect, and should probably be "at least once". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(e) the invention was described in-
(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-5, 7, 9-11, 13 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Edmond et al. (US 6,906,352), hereinafter referred to as Edmond '352. As to claim 1, Edmond '352, Figure 13, discloses a nitride semiconductor light emitting device comprising: an n-type nitride semiconductor layer (51)(col. 15, line 36); an In-containing super lattice structure layer (56)(col. 15, lines 27-29) formed above the n-type nitride semiconductor layer; a first electrode contact layer, which may be taken as the lowermost layer (76)(col. 16, line 1) of the active layer (60), formed above the super lattice structure layer; a first cluster layer, further described below, which may be formed above the first electrode contact layer; a first In-containing nitride gallium layer, which may be taken as the lowermost layer (74)(col. 15, lines 66-67) of the active layer (60) formed above the first cluster layer; a second cluster layer, further described below, which may be formed above the first In- containing nitride gallium layer (lowermost 74); an active layer (col. 16, line 38), comprising the balance of the layers (74) and (76) of composite layer (60), formed above the second cluster layer; a p-type nitride semiconductor layer (64)(col. 16, lines 63-64) formed above the active layer; and a second electrode contact layer (66)(col. 16, line 66) formed above the p- type nitride semiconductor layer. The first and second cluster layers are disclosed by Edmond '352, Figure 7 (col. 11, lines 10-13), and are embodiments of discrete crystal portions, more fully disclosed in Edmond et al. (US 6,201,262), Figures 16-18 (col. 6, lines 4-11), hereinafter referred to as Edmond '262.

As to claim 2, Edmond '352, Figure 13, discloses that the active layer (60) comprises: a first quantum well layer having an $In_yGa_{1-y}N$ well layer/$In_zGa_{1-z}N$ barrier layer structure, embodied as two of the plurality of layers (74)(InGaN) and (76)($In_xGa_{1-x}N$); a second In-containing nitride gallium layer, embodied as one of the layers (74), formed above the first quantum well layer; and a second quantum well layer

formed above the second In- containing nitride gallium layer to have an $In_yGa_{1-y}N$ well layer/$In_zGa_{1-z}N$ barrier layer structure, embodied as two more of the plurality of layers (74)(InGaN) and (76)($In_xGa_{1-x}N$).

As to claim 3, Edmond '352, discloses a substrate (50)(col. 15, line 19) formed under the n-type nitride semiconductor layer (51), which is itself taught to be a buffer layer (col. 15, line 36), and may then be considered to have been formed in two identical layers, one the claimed buffer layer and the other the claimed n-type nitride semiconductor layer.

As to claim 4, Edmond '352 discloses (col. 15, lines 36-39), via Edmond et al. (US 5,523,598)(col. 5, line 25), incorporated by reference, that the buffer layer (51) may be comprised of aluminum indium gallium nitride.

As to claim 5, Edmond '352, Figure 1, discloses an embodiment with an aluminum indium nitride buffer layer (23).

As to claim 7, Edmonds '262 discloses (col. 6, lines 26-27) that the clusters of the cluster layer are as small as 10 nm in diameter, which is within the scope of being of atomic scale.

Claim 9 is a product-by-process claim. This claim does not distinguish over the Edmond '352 reference regardless of the process used to form the first In-containing gallium nitride layer, because only the final product is relevant, not the recited process of growing the surface shape in a spiral mode.

Note that a "product by process" claim is directed to the product per se, no matter how actually made. In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

As to claim 10, Edmond '352, discloses that the first In-containing nitride gallium layer, which may be taken as the lowermost layer (74)(col. 15, lines 66-67) of the active layer (60) formed above the first cluster layer, is in direct contact with the active layer.

As to claim 11, Edmond '352 discloses that the active layer has a multi quantum well structure, which has an $In_xGa_{1-x}N$ well layer (74)/$In_yGa_{1-y}N$ (76) barrier layer (col. 15, lines 65-67).

As to claim 13, Edmond '352 discloses that the first In-containing gallium nitride layer (74)(InGaN) is expressed as $In_xGa_{1-x}N$ where x takes the value 1.

As to claim 22, Edmond '352, discloses (col. 16, lines 63-64) that the p-type nitride semiconductor layer (64) is doped with magnesium.

Claims 24, 26, 27 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Edmond '352. As to claim 24, Edmond '352, Figure 13, discloses a nitride semiconductor light emitting device comprising: a first electrode contact layer, which may be taken as the lowermost layer (76)(col. 16, line 1) of the active layer (60), a first cluster layer, further described below, which may be formed above the first electrode contact layer; a first In-containing nitride gallium layer, which may be taken as the lowermost layer (74)(col. 15, lines 66-67) of the active layer (60) formed above the first cluster layer; a second cluster layer, further described below, which may be formed above the first In- containing nitride gallium layer (lowermost 74); an active layer (col. 16, line 38), comprising the balance of the layers (74) and (76) of composite layer (60), formed above the second cluster layer; and a p-type nitride semiconductor layer (64)(col. 16, lines 63-64) formed above the active layer. The first and second cluster layers are disclosed by Edmond '352, Figure 7 (col. 11, lines 10-13), and are embodiments of discrete crystal portions, more fully disclosed in Edmond '262, Figures 16-18 (col. 6, lines 4-11).

As to claim 26, Edmond '352, Figure 13, discloses that the active layer (60) comprises: a first quantum well layer having an $In_yGa_{1-y}N$ well layer/$In_zGa_{1-z}N$ barrier layer structure, embodied as two of the plurality of layers (74)(InGaN) and (76)($In_xGa_{1-x}N$); a second In-containing nitride gallium layer, embodied as one of the layers (74), formed above the first quantum well layer; and a second quantum well layer formed above the second In- containing nitride gallium layer to have an $In_yGa_{1-y}N$ well layer/$In_zGa_{1-z}N$ barrier layer structure, embodied as two more of the plurality of layers (74)(InGaN) and (76)($In_xGa_{1-x}N$).

As to claim 27, Edmond '352, Figure 13, discloses a second electrode contact layer (66)(col. 16, line 66) formed above the p- type nitride semiconductor layer.

As to claim 31, Edmond '352 discloses that the active layer has a multi quantum well structure, which has an $In_xGa_{1-x}N$ well layer (74)/$In_yGa_{1-y}N$ (76) barrier layer (col. 15, lines 65-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond '352 in view of Chua et al. (JP 2002-16284A). Edmond '352 discloses the device of claim 11, as described above. Edmond '352 does not disclose expressly that the $In_xGa_{1-x}N$ well layer/$In_yGa_{1-y}N$ barrier layer have indium contents of $0<x<0.35$ and $0<y<0.1$, respectively. Chua et al., paragraph [0014], discloses an active layer in a gallium nitride light-emitting device with the $In_xGa_{1-x}N$ well layer/$In_yGa_{1-y}N$ barrier layer having In content of $0<x<0.1$ and $0<y<x$, which is within the scope of $0<x<0.35$ and $0<y<0.1$, respectively. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the active layer as claimed. The motivation for doing so would have been to tune the emission wavelength of the device. Therefore, it would have been obvious to combine Chua et al. with Edmond '352. to obtain the invention as specified in claim 12.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond '352 in view of Sugiura et al. (US 6,015,979). Edmond '352 discloses the device of claim 1, as described above. Edmond '352 does not disclose expressly that the second electrode contact layer is doped with silicon. Sugiura et al. discloses (col. 15, lines 66-67) an electrode contact layer formed of GaN, as in Edmond '352, and doped with silicon. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the contact layer as claimed. The motivation for doing so would have been to form

a film with good flatness (Sugiura et al., col. 16, line 3). Therefore, it would have been obvious to combine Sugiura et al. with Edmond '352. to obtain the invention as specified in claim 19.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond '352 in view of Suzuki et al. (JP 2002-16284A). Edmond '352 discloses the device of claim 2, as described above. Edmond '352 does not disclose expressly that the second In-containing gallium nitride layer has a chemical formula $In_xGa_{1-x}N$ ($0<x<0.1$), and a thickness of 300-2000 angstroms. Suzuki et al., Figure 2, discloses an active layer in a gallium nitride light-emitting device with chemical formula $In_xGa_{1-x}N$ ($0<x<1$), which is within the claimed range of $0<x<0.1$, and a barrier layer with chemical formula $In_yGa_{1-y}N$ ($0<y<x$) and thickness of as much as 45 angstroms for the well layer and (5 x 45) 225 angstroms for the barrier layer for a total active layer thickness of (225 + 45) 270 angstroms, which is within the scope of being about 300 angstroms. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the active layer as claimed. The motivation for doing so would have been to increase the growth speed of the layer (Suzuki et al., SOLUTION). Therefore, it would have been obvious to combine Suzuki et al. with Edmond '352. to obtain the invention as specified in claim 23.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond '352 in view of Tanizawa (US 6,657,234). Edmond '352 discloses a nitride semiconductor light emitting device comprising a strain control layer (56)(col. 15, lines 5-7 and 27-28); an active layer (60) formed above the strain control layer to have a first quantum well layer, a second quantum well layer, and an $In_xGa_{1-x}N$ layer interposed between the first quantum well layer and the second quantum well layer (col. 15, lines 65-67); and a p-type nitride semiconductor layer (66) formed above the active layer. Edmond '352 does not disclose expressly n-type first or second contact layers formed in the structure. Tanizawa, Figure 1, discloses a nitride semiconductor device with an n-type contact layer (4)(col. 4, line 36). At the time of invention, it would have been obvious to a person of ordinary skill in the art to form first and second n-type contact layers in the device of Edmond '352. The motivation for doing so would have been to support an n-type electrode layer (col. 7, lines 57-59). Therefore, it would have been obvious to combine Tanizawa with Edmond '352 to obtain the invention as specified in claim 37.

Allowable Subject Matter

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the first electrode contact layer is a Si-In co-doped gallium nitride layer.

Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the cluster layers are formed of SiN_a where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claims 14 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the cluster layers are formed of SiN_a where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the cluster layers are formed of SiN_a where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the second electrode contact layer is formed to have one selected from an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure, an $In_xGa_{1-x}N$ super grading structure or $(In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice)/n-GaN layered structure. The second electrode contact layer of Edmond '352 is p-GaN. Subject to resolution of the 112 rejection to claim 17 based on lack of antecedent basis as noted above, claim 17 is also objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

Claim 20 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the n-type nitride semiconductor layer, embodied as n-AlGaN buffer layer (51) in Edmonds '352 and the In-containing super lattice structure, embodied as layer (56) in Edmonds '352 are formed in repeating units. The layers of Edmonds '352 comprise a different, non-repeating layering structure than that of claim 20.

Claim 25 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the cluster layers are formed of SiN_a where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claim 28 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the second electrode contact layer is formed to have an In- containing super lattice structure. The second electrode contact layer of Edmond '352 is p-GaN.

Claim 29 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device with a Si-doped In-containing super lattice structure formed above the p-type nitride semiconductor layer.

Claim 30 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device wherein the first electrode contact layer comprises: an In-doped GaN layer; an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer formed above the In-doped GaN layer; and a Si-In co-doped GaN layer formed above the $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure layer.

Claims 32 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device where the cluster layers are formed of SiN_a

where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claims 34, 35 and 36 are allowed. No prior art discloses the claimed device structure where the cluster layers are formed of SiN_a where a>0. Edmond '262, teaches clusters formed of gallium nitride and indium gallium nitride (col. 6, lines 6-8).

Claim 38 is allowed. No prior art discloses the claimed device structure where the second electrode contact layer is formed from an $In_xGa_{1-x}N/In_yGa_{1-y}N$ super lattice structure. The second electrode contact layer of Edmond '352 is p-GaN.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott R. Wilson whose telephone number is 571-272-1925. The examiner can normally be reached on M-F 8:30 - 4:30 Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/A. Seifer/

Primary Examiner
AU 2826

srw
December 26, 2007